CHAPTER NINE
Database and Travel Model

Every congestion management agency, in consultation with the regional transportation planning agency (MTC in the Bay Area), cities, and the county, must develop a uniform database on traffic impacts for use in a countywide travel model.[1] The CMA must approve computer models used for subareas, including models used by local jurisdictions for land-use impact analysis. All models must be consistent with the modeling methodology and databases used by MTC.

The purpose of this requirement is to bring to the congestion management decision making process a uniform technical basis for analysis. This includes consideration of the benefits of transit service and transportation demand management programs, as well as projects that improve congestion on the CMP-designated system. The modeling requirement is also intended to assist local agencies in assessing the impacts of new development on the transportation system.

The Alameda countywide travel model is an essential tool to the CMP planning process. The Alameda County CMP is a forward-looking program, espousing a philosophy of early action, to prevent conditions from deteriorating. The model allows the CMA to anticipate the potential impacts of local land-development decisions on the Metropolitan Transportation System.

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[1] California Government Code Section 65089(c)

DATABASE DEVELOPMENT
The database developed for use with the countywide travel model is based on data summarized in the *Projections 2002* report prepared by the ABAG. Projections of socioeconomic variables were made for the traffic analysis zones defined for Alameda County. By aggregating the projections made for each zone, the CMA can produce projections of socioeconomic characteristics for unincorporated areas of the county, the 14 cities and for the four planning areas for Alameda County.

Note: Projections 2003, SMART Growth Forecast, developed by ABAG will be incorporated into the model when they become available in late 2003.

MODEL DEVELOPMENT
The framework established for the model encompasses the following four components:

- Trip generation (forecast of the number of trips by traffic analysis zone)

- Trip distribution (distribution of forecast trips between each traffic analysis zone)

- Modal split of inter-zonal trips (distribution of trips by mode within each traffic analysis zone)

- Assignment (forecast of trips originating or destined to external zones)

These are the typical model components found in any model whose purpose is to produce simulations of travel demand based on different assumptions about land-use, demographic and transportation characteristics.

Development and validation of the model were predicated on the following concepts:

- Consistency, to the greatest extent possible, with the assumptions and procedures established and used by MTC to produce regional travel-demand forecasts. More specifically, maintaining the same variables in the equations that comprise the trip generation, trip distribution and mode split components of MTC s travel-demand model framework.

- Where necessary (in order to produce validated forecasts of travel on arterials or intra-county transit services), enhance the capacity of MTC's models by incorporating the simulation of certain types of travel not modeled by MTC.

The model was developed using the EMME/2 software, which is an interactive transportation planning program that produces numerical and graphic representations of travel supply, and demand.

The model has been structured to provide forecasting detail that adequately addresses the evaluation needs of both countywide and corridor-specific transportation strategies. To accomplish these objectives, the Alameda countywide model has been developed and validated by defining a graphic zone structure detailed enough to depict changes in land use and demographic characteristics that would affect travel demand on arterials and intra-county transit systems and by establishing

highways and transit networks detailed enough for those types of travel demand.

In addition, the model incorporates a representation of land-use and demographic characteristics of the nine-county Bay Area, which allows it to produce travel-demand forecasts that incorporate influences of regional travel demand on transportation facilities in Alameda County. Travel originating or terminating outside the nine-county Bay Area is also taken into account, though not through the use of a detailed land-use database.

PLANNING AREAS

Alameda County has been subdivided into four areas of analysis, or planning areas. Planning areas are analogous to four of the five MTC superdistricts in Alameda County[2]

The planning areas are defined as follows:

- Planning Area 1 consists of the cities of Albany, Berkeley, Emeryville, Oakland, Alameda and Piedmont;

- Planning Area 2 consists of San Leandro, Hayward, and the unincorporated areas of Castro Valley and San Lorenzo;

- Planning Area 3 consists of Union City, Newark and Fremont; and

- Planning Area 4 consists of Pleasanton, Dublin, Livermore and the unincorporated areas of east County.

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[1] MTC superdistricts 18 and 19 comprise Planning Area 1, while superdistricts 17,16 and 15 equate to Planning Areas 2, 3 and 4, respectively.

TRAFFIC ANALYSIS ZONE SYSTEM

The traffic analysis zone structure developed for the Alameda countywide travel model is a refinement of the zone structure used by MTC for their nine-county regional travel model. Traffic analysis zones are small geographical subdivisions of a region. Socioeconomic variables, such as households and employment data, are collected at the traffic analysis zone level for input into the travel-demand models. Ultimately, the auto vehicle trips and number of individual trips on transit ("person trips") will be assigned from each traffic analysis zone onto the highway and transit networks.

The Alameda countywide model required disaggregating or splitting the MTC zones into more and smaller traffic analysis zones. The new Alameda County traffic analysis zones nest precisely within the larger MTC zones. This ensures accurate disaggregation of MTC s person trip tables to the traffic zones, and allows direct comparisons between the Alameda countywide model outputs and those of the MTC model.

Internal Alameda County Zones

Within Alameda County, MTC's zone system was refined to better suit the more detailed model network proposed for the Alameda countywide model. As a result of this zone refinement effort, the MTC zones in Alameda County were increased approximately to 982 (728 in Alameda County and 254 outside of the county). The 728 traffic analysis zones within Alameda County are grouped by the four planning areas. (Note: Maps depicting the traffic analysis zones are available upon request at the CMA offices.)

External Zones

Outside of Alameda County, the traffic analysis zone level of detail decreases as the distance from Alameda County increases. The MTC zone structure was used for areas directly adjacent to Alameda County. Outside of Alameda County, 254 new traffic analysis zones were created from the MTC zones.

Included in the model were six external zones at the San Joaquin County line, since travel from San Joaquin County has a large influence on travel patterns in Alameda County. Including external zones and zone numbers left available for possible future zone splits, the Alameda countywide travel model has been established to produce forecasts for a system of 982 zones.

MODEL RESULTS

The model produces the following countywide travel information:

- trip generation

- trip distribution

- modal split of inter-zonal trips

- forecast of trips originating or destined to external zones

- peak hour level of service and traffic volume projections by segment (2005, 2020, and 2025)

- miles of congestion, by type of facility (arterial, freeway)

- vehicle-miles traveled, by facility and by level of service

- vehicle-hours traveled, by facility and by level of service

Model Adequacy

The model has been thoroughly tested and validated for 1990 conditions. The testing and validation procedure compared forecast results from the model to observed traffic volumes and transit ridership data. The model will be further refined with the addition of updated land-use information and network characteristics that will be submitted periodically to the CMA by local jurisdictions as part of the land-development impact analysis process of the CMP. The CMA initiated a comprehensive update of the countywide travel model in 1995. With assistance from transit operators and local jurisdictions, the updated model was recalibrated to 1990 census information, and enhancements were added to the model to increase reliability of the forecasts. The 2000 census data are not yet available to update the model base year to 2000.

SUBAREA MODELS

The Tri-Valley and the Tri-Cities area (planning areas 3 and 4) have developed or are in the process of developing transportation models that are subsets of the countywide model. Neither is certified by the CMA at this time. The city of Hayward has completed the development of a sub-area model for use in Planning Area 2, and this subarea model was certified by the CMA in 1996. The subarea model will need to be recertified pending an update of the Planning Area 2 model land use to *Projections 2002*.

2004 MODEL UPDATE

The CMA travel demand model will undergo a major update prompted by the 2000 Census. It is expected that the software will be changed to be consistent with MTC and some surrounding counties. The change will permit complete consistency with the basic assumptions of the regional model and conserve limited resources.

The update is expected to begin in 2004. The current CMA validated model with updated network and demographic information was accepted by MTC. The CMA will use the validated model until such time as the development of the new model is completed by the CMA. The existing model is consistent with the MTC model as follows: general approach; demographic data, pricing assumptions, network assumptions, auto ownership assumptions, trip general, trip distribution, mode choice and traffic assignment. Specific details on each element are available at the CMA offices.